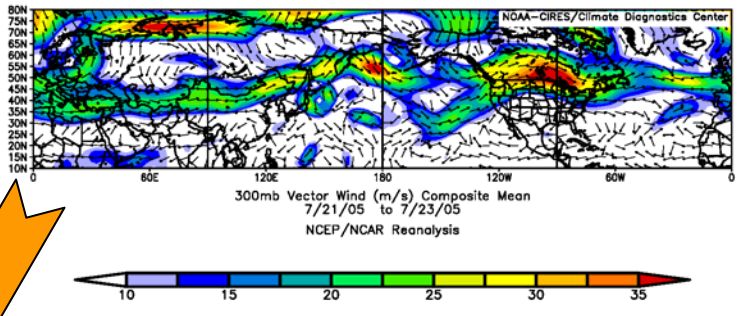
Global O3 and CO: A view from TES

Annmarie Eldering and the TES team

November 2005

Transport and dynamics



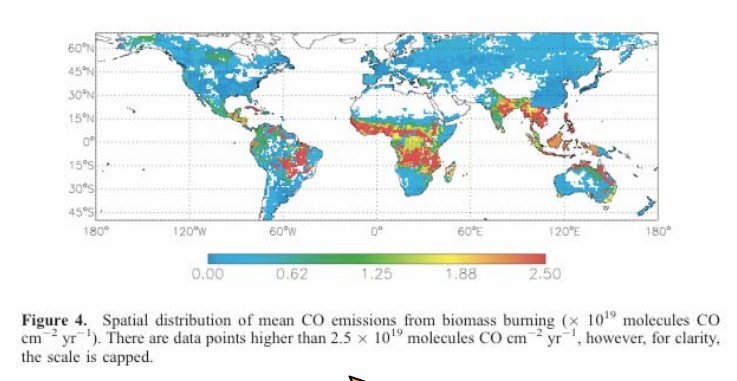
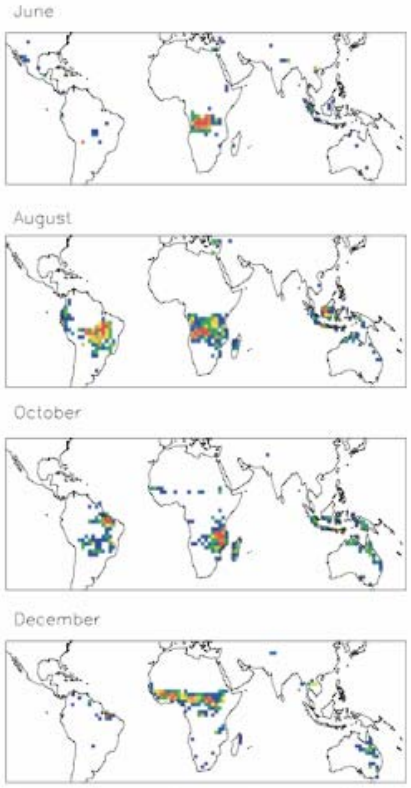
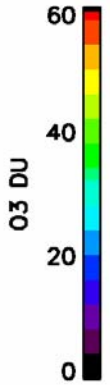
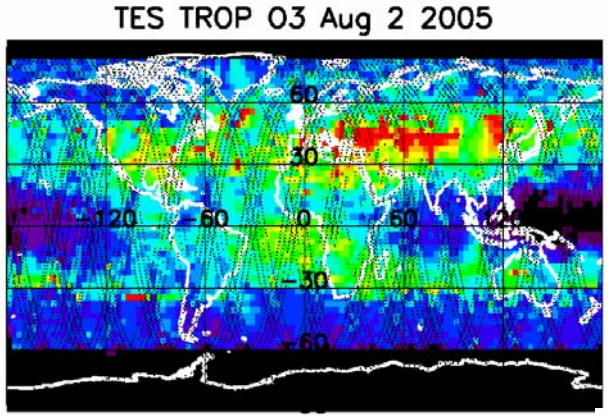


Figure 4. Spatial distribution of mean CO emissions from biomass burning ($\times 10^{19}$ molecules CO cm^{-2} yr^{-1}). There are data points higher than 2.5×10^{19} molecules CO cm^{-2} yr^{-1}, however, for clarity, the scale is capped.

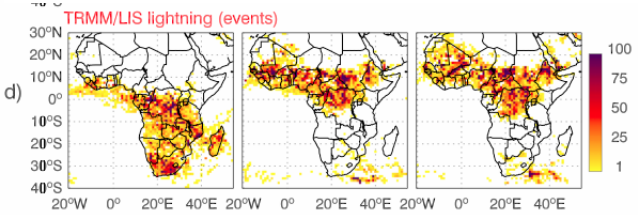
emissions

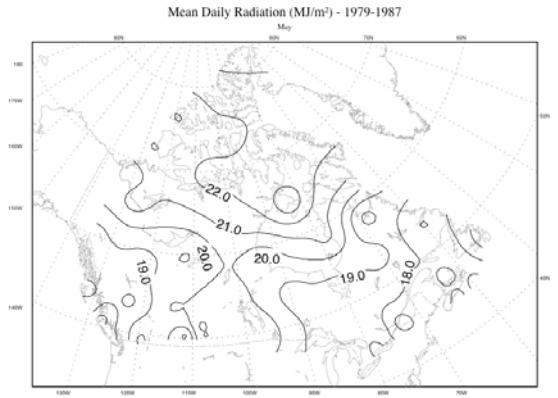






Radiation/ photochemistry



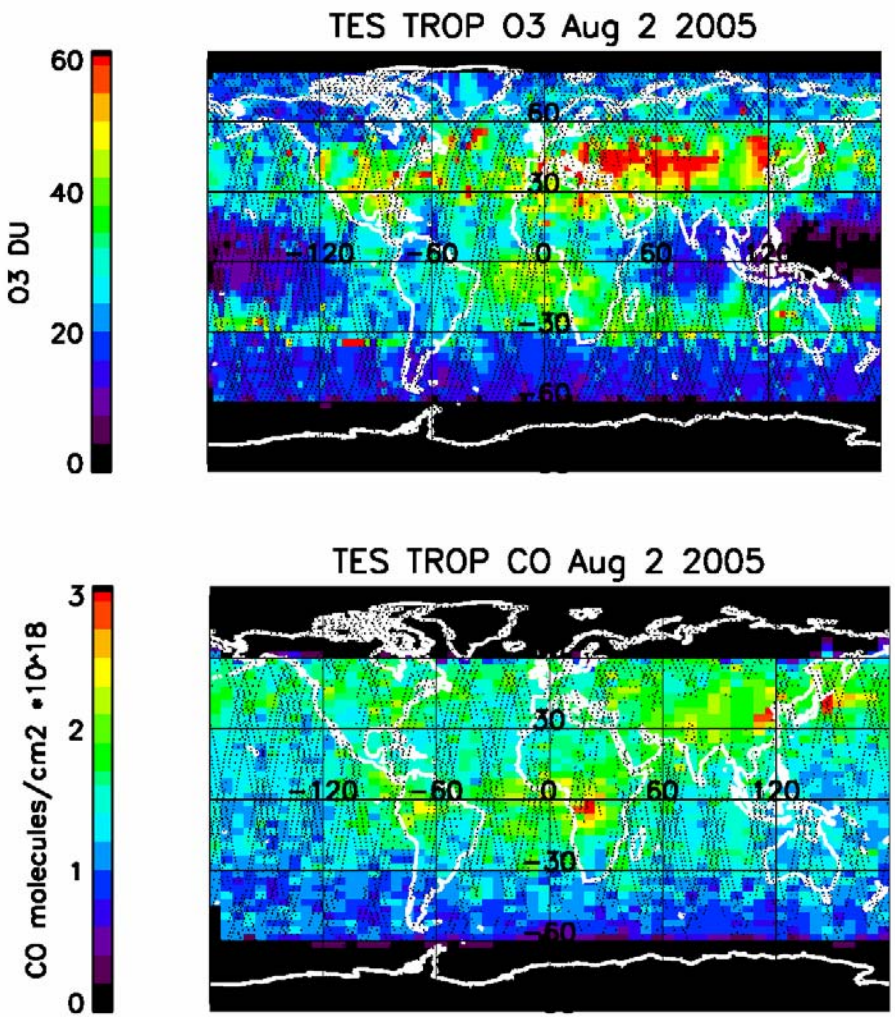


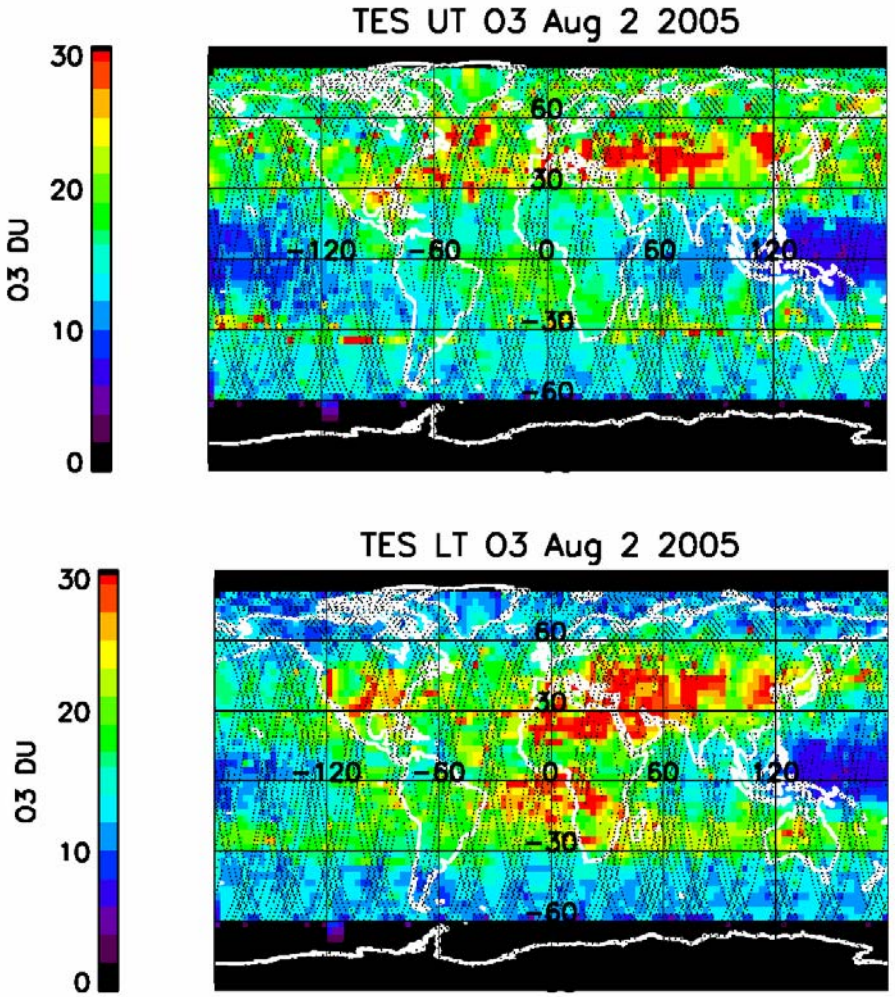
Outline and Data

- Start with seasonal look at the big picture with maps
- Vertical distributions
  - Between Asia and N.A.
  - Between N.A and Europe
  - West of Africa
- Using V1 data, available at the DAAC
- Data has been screened
- Presenting averages of 5 global data sets for three different time periods

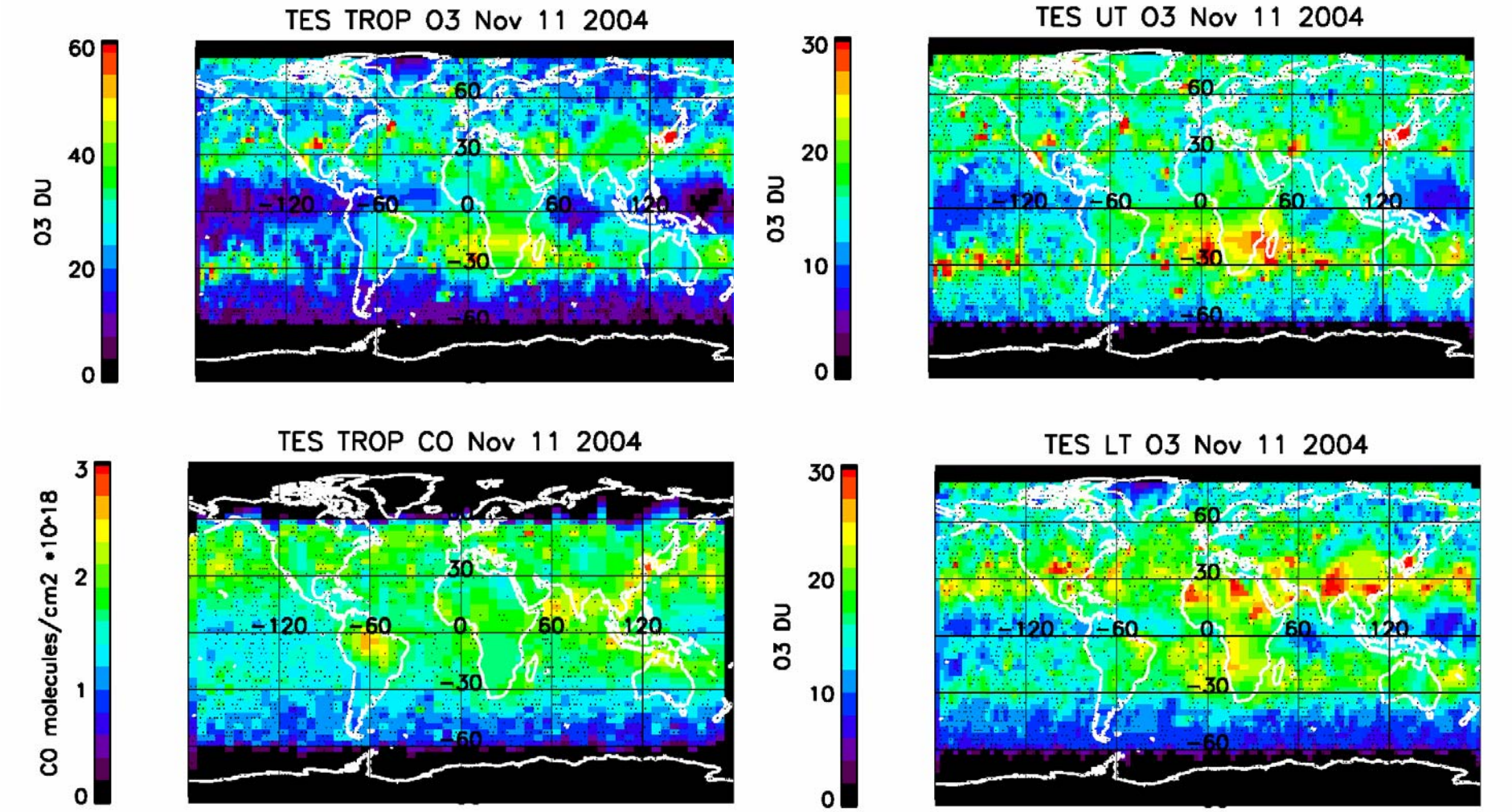
NH ozone present throughout the troposphere at this time of year, as expected.

TES observes CO and lower troposphere ozone in biomass burning region.

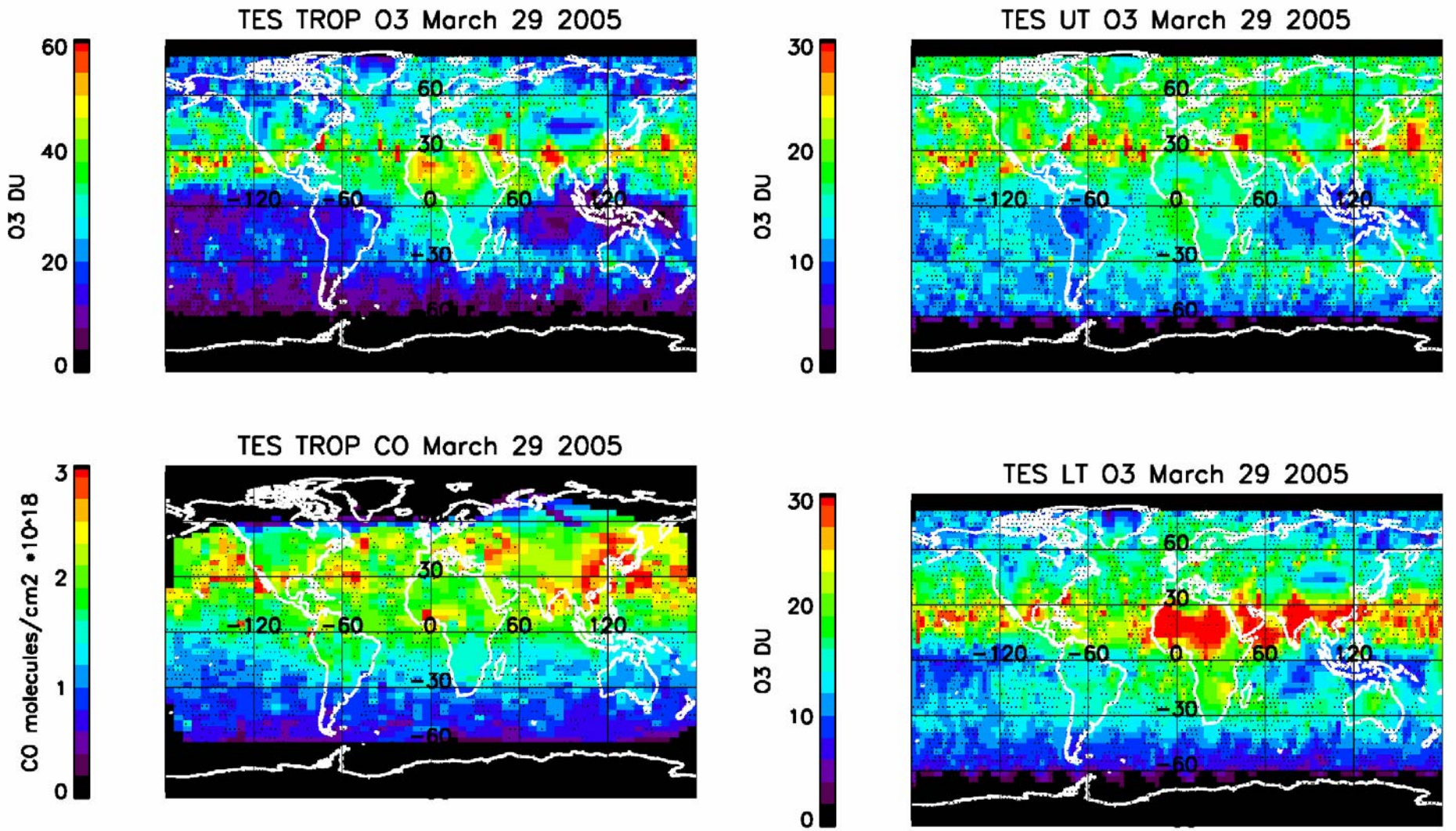




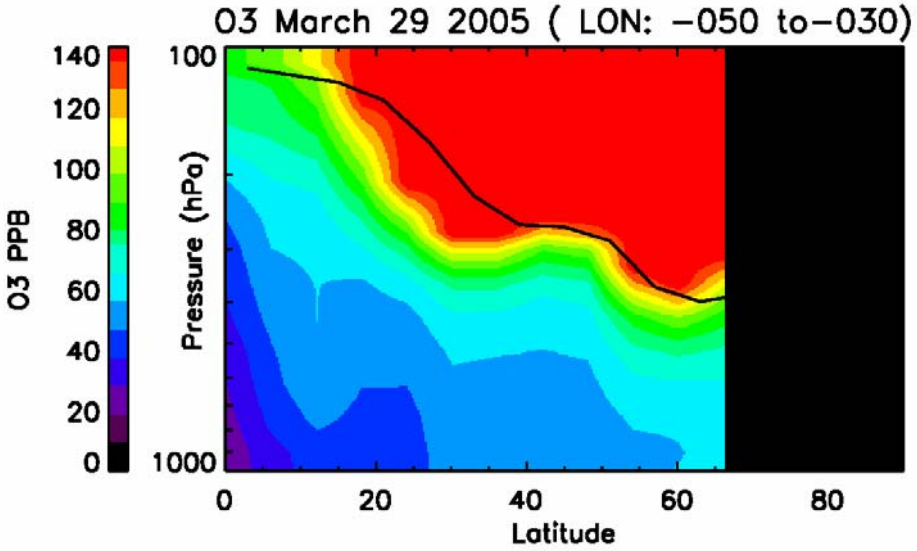
Ozone higher in the southern hemisphere during their summer. In contrast to August, SH ozone is in upper troposphere, NH ozone is in lower troposphere. There are few CO hotspots.

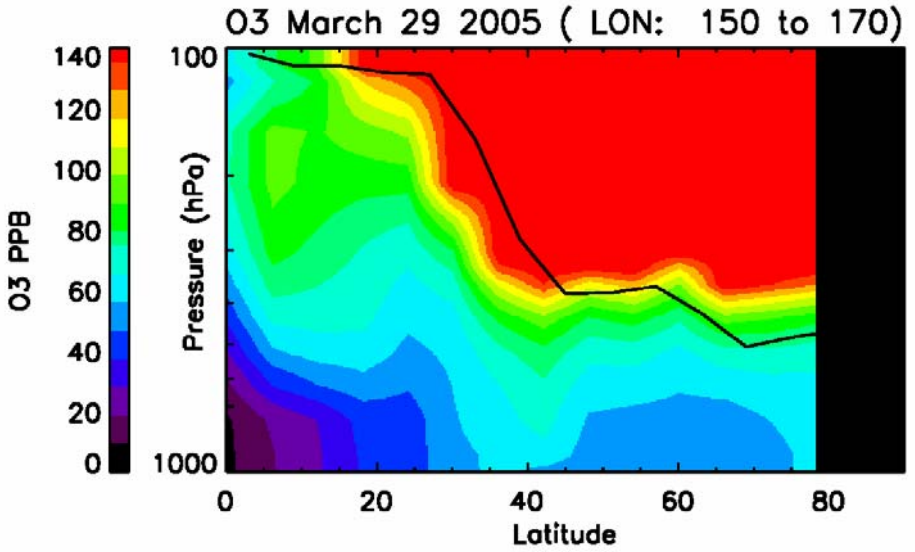


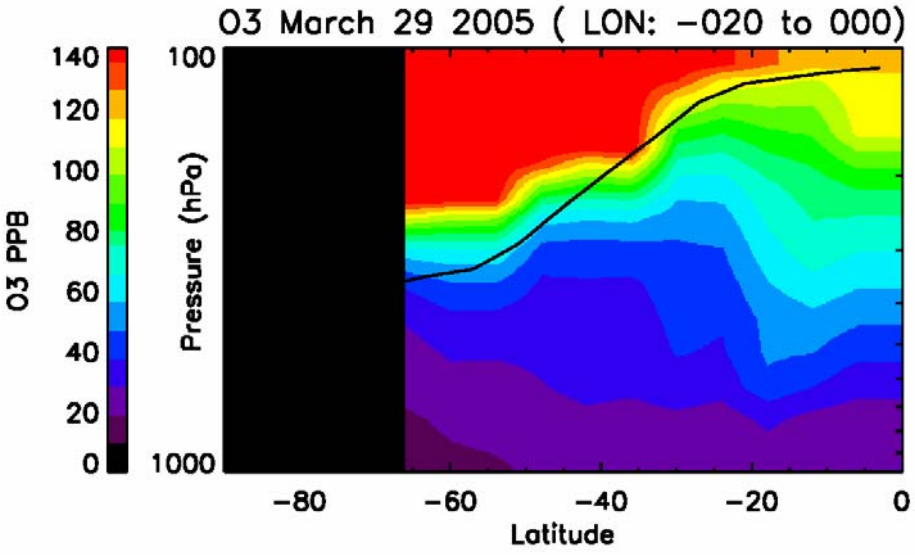
March reveals elevated O3 and CO in the northern hemisphere, most of the ozone appears to be in the lower troposphere.

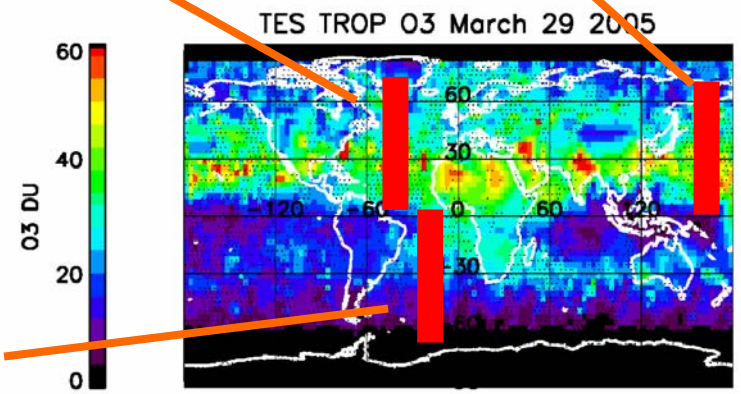


We now look at the vertical distribution in three regions.









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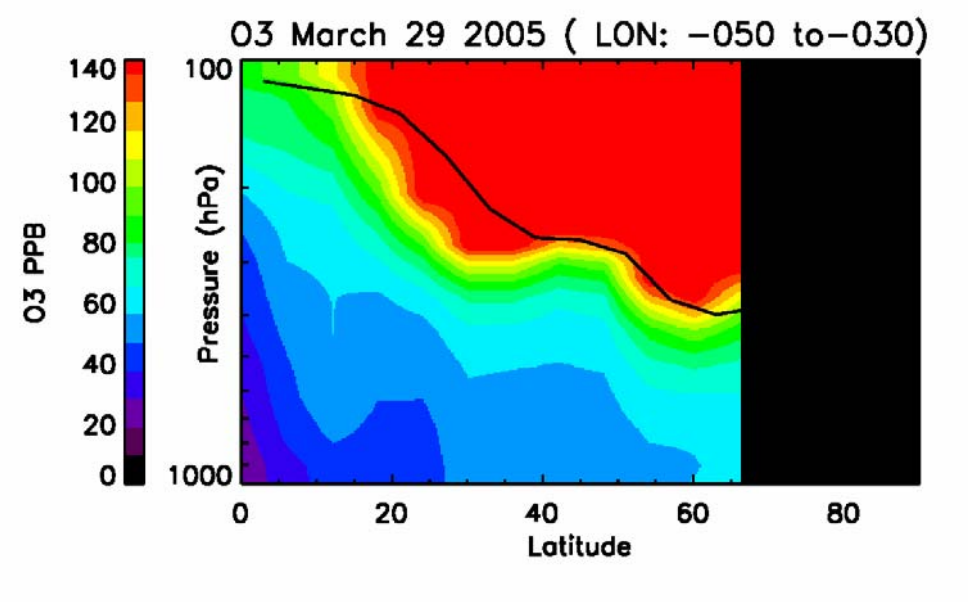
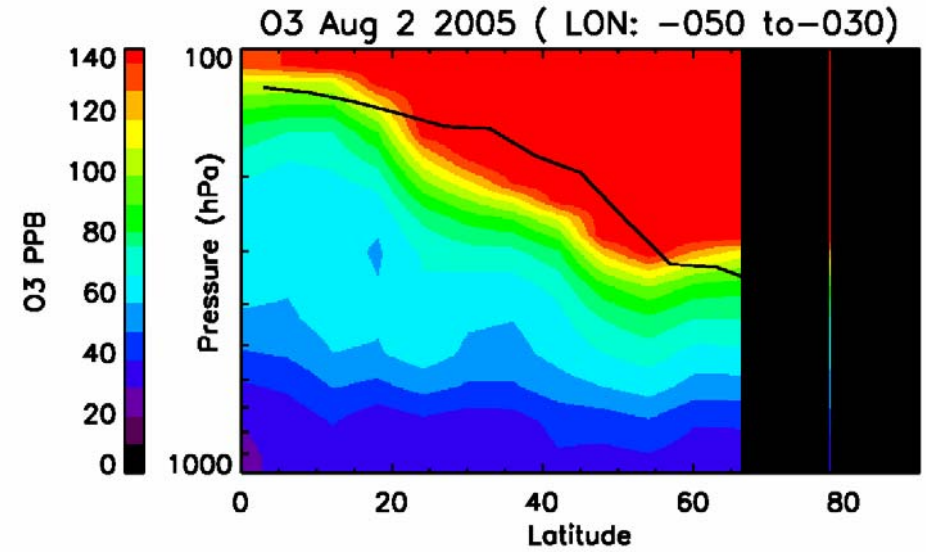
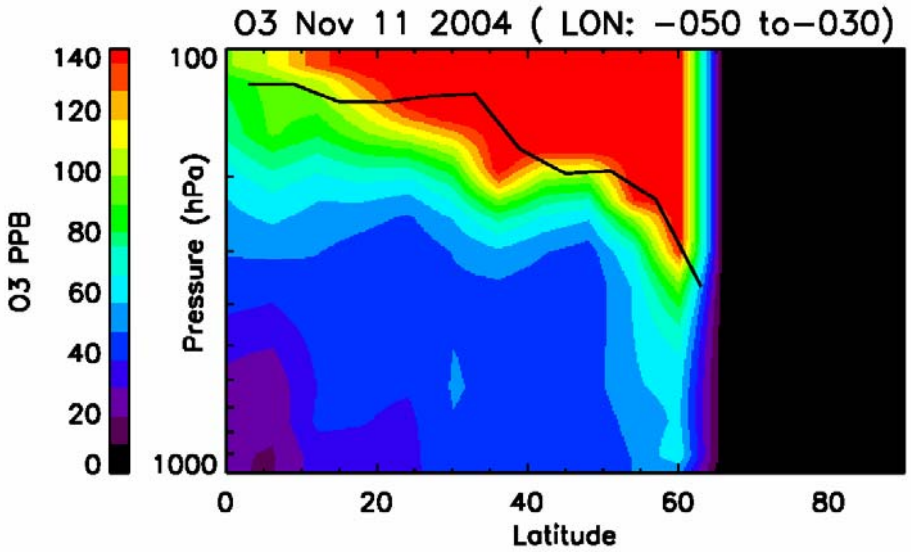
Between US and Europe



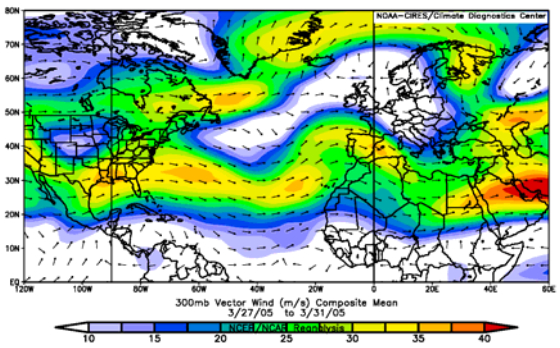
Weak latitudinal gradient in the lower troposphere in August. Vertical distribution of tropospheric column can be explored with TES data

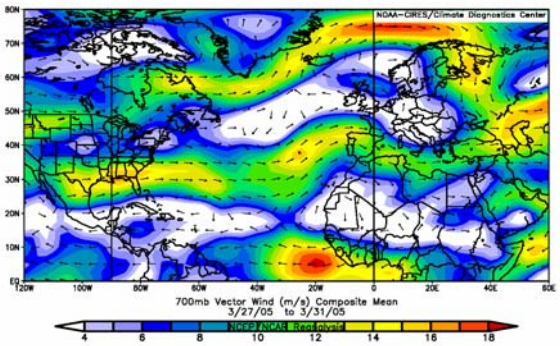




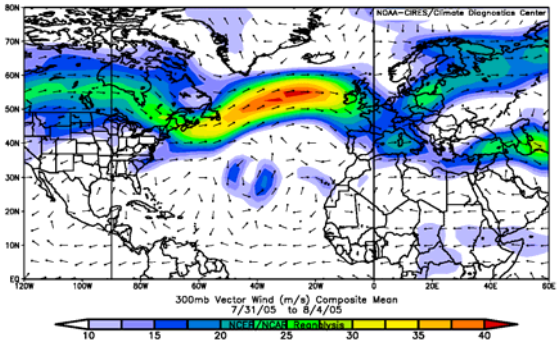
Mean wind fields at 300mb (top row) and 700mb (bottom row)

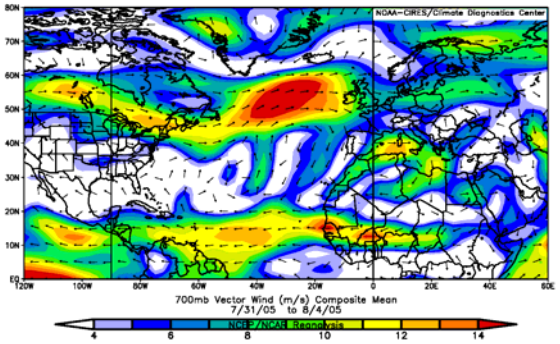
March



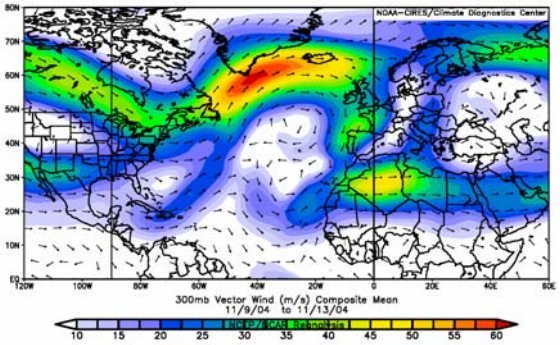


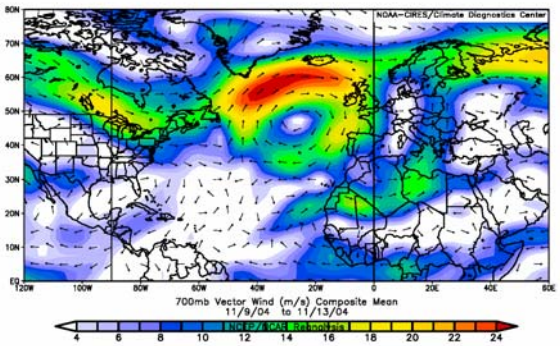
Aug





Nov





Model estimates of flux of ozone into Europe (12.5W), Auvray and Bey, JGR, 2005

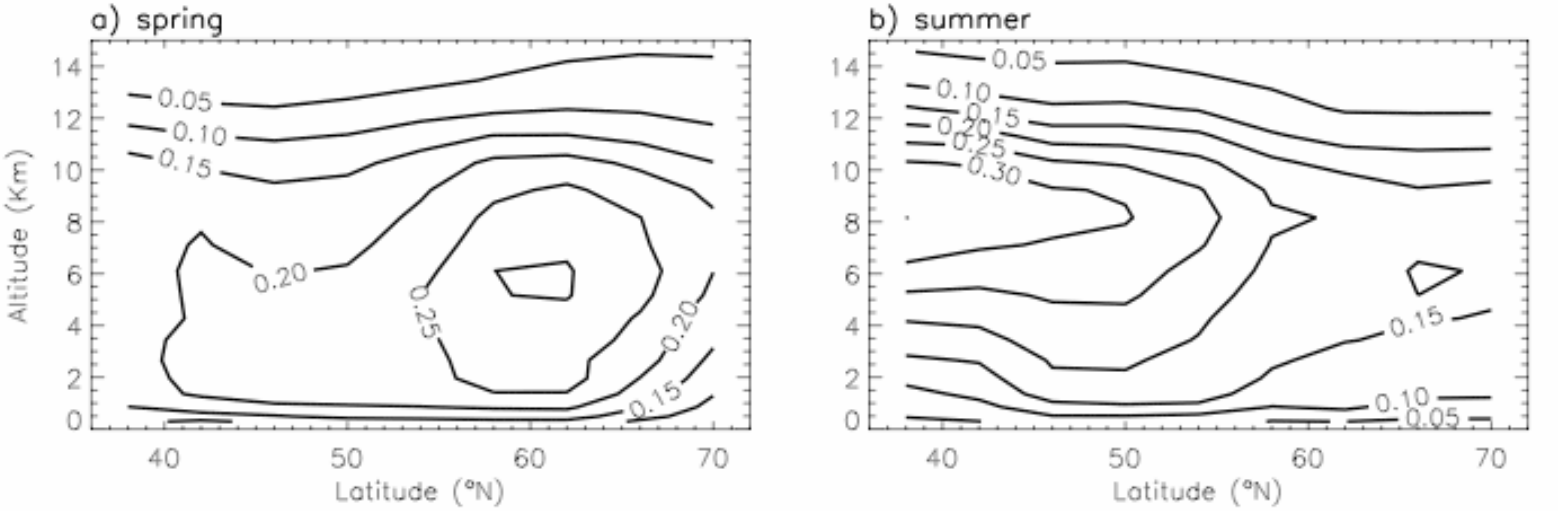
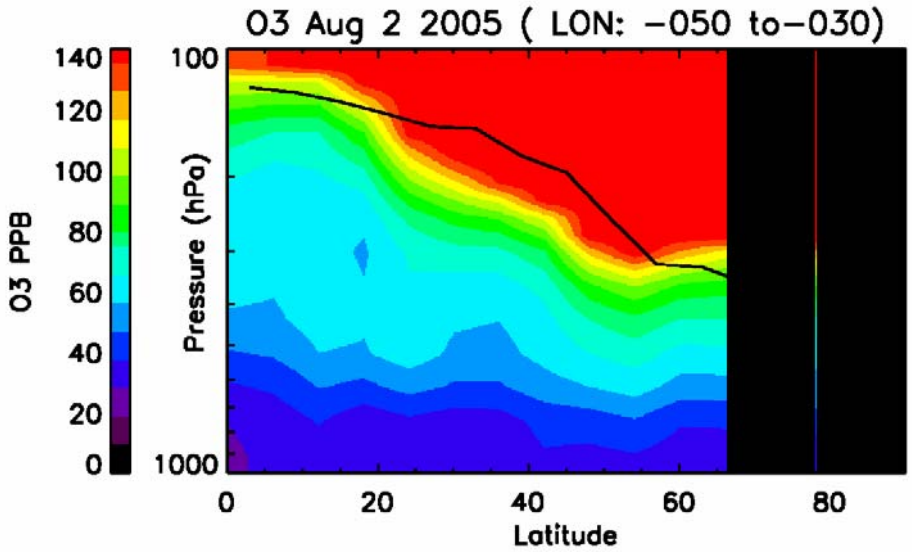
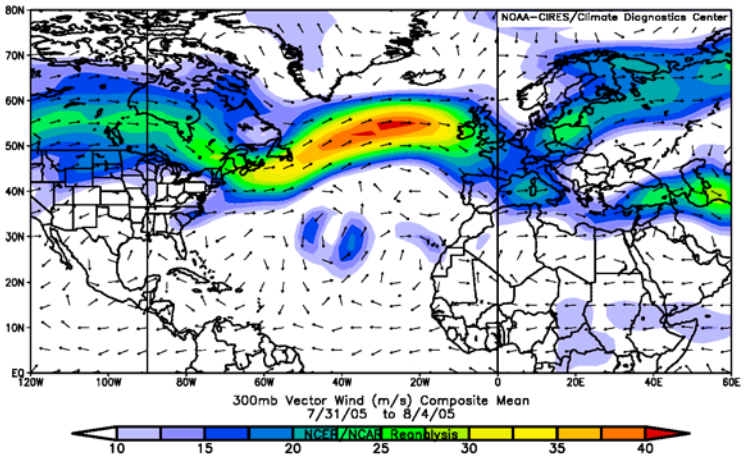


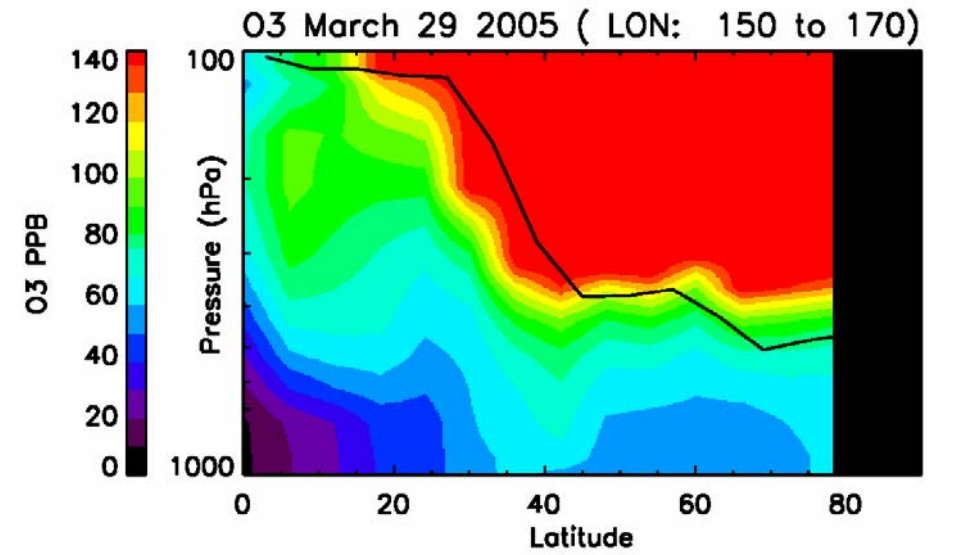
Figure 11. Seasonal North American O_3 fluxes entering the west side of Europe (12.5°W) in spring and

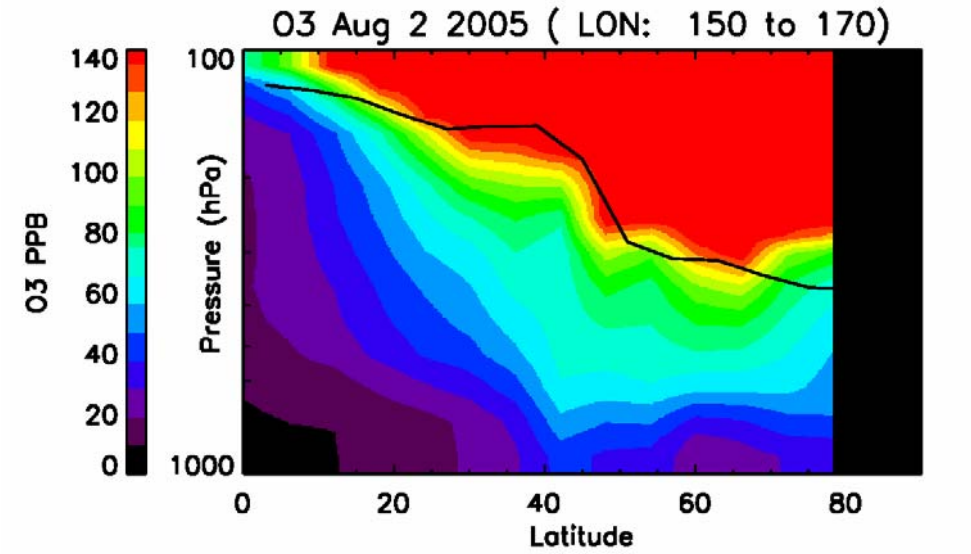


Mean winds 300mb

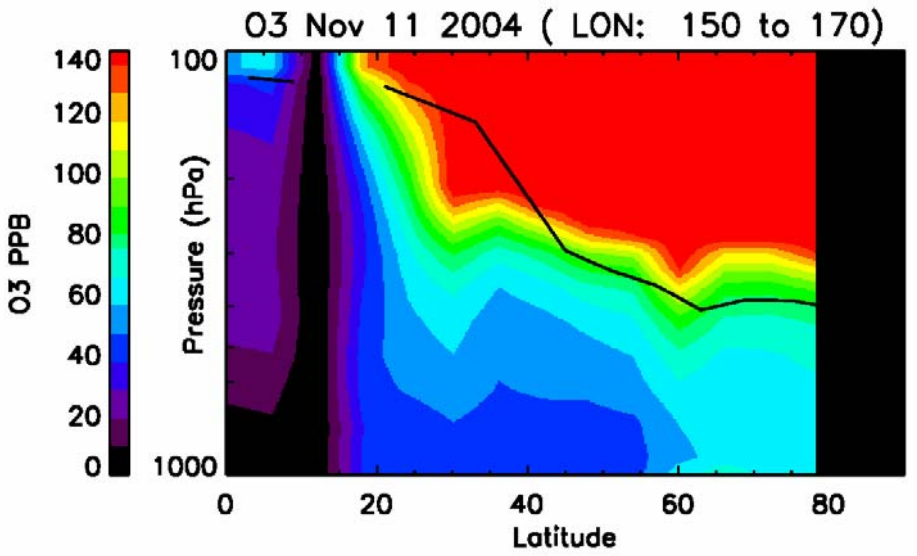


Vertical distribution of ozone between Asia and US over the year





Consistent with spatial patterns of spring time maximum in trans-pacific transport of Asian pollution (Liu et al, JGR, 2005)



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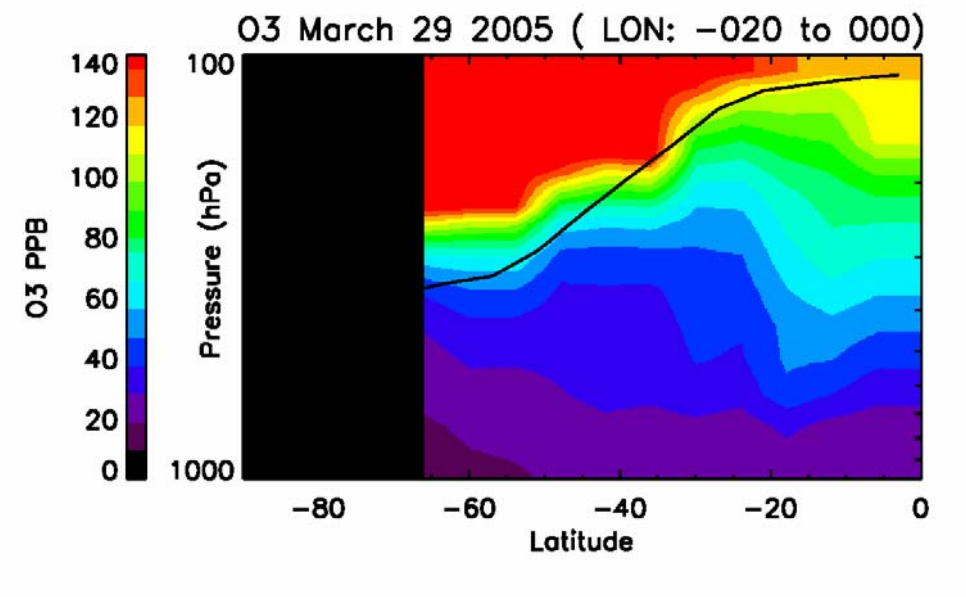
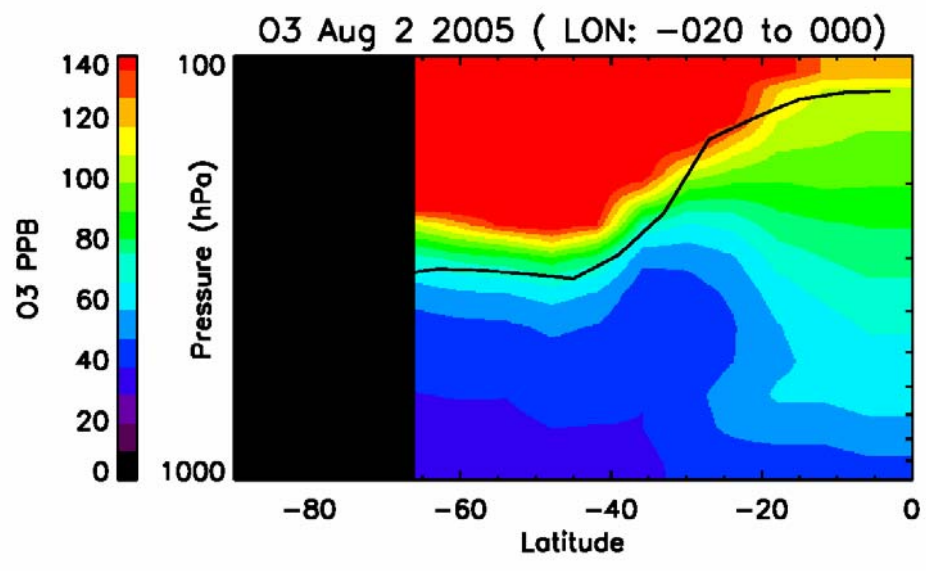
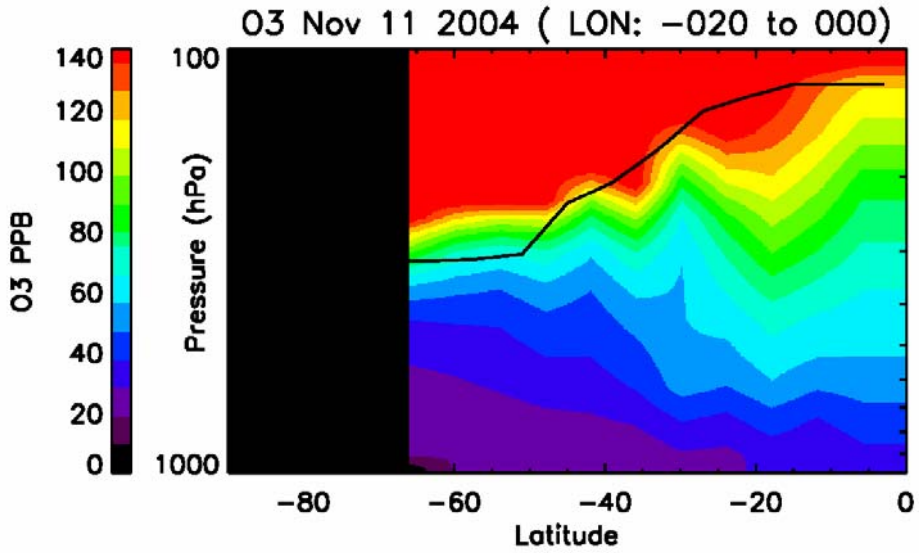
Eldering: Aura

Southern Hemisphere - West of Africa



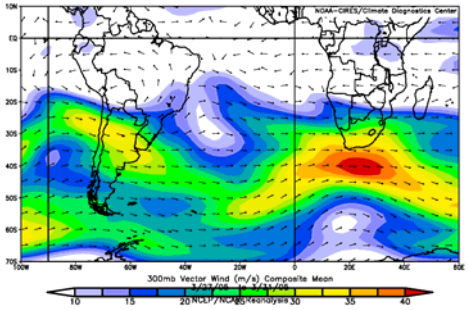
August ozone much more elevated than other seasons, especially in lower troposphere. March and November show elevated ozone in the upper troposphere.

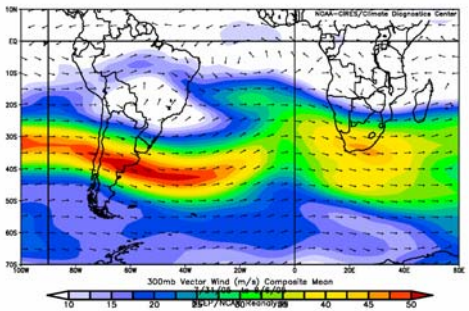


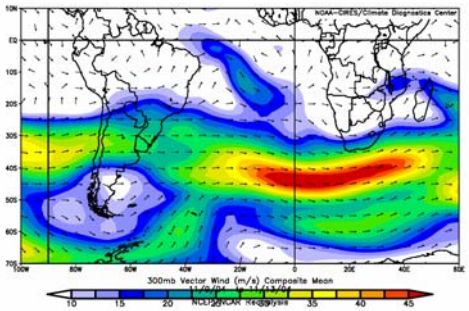


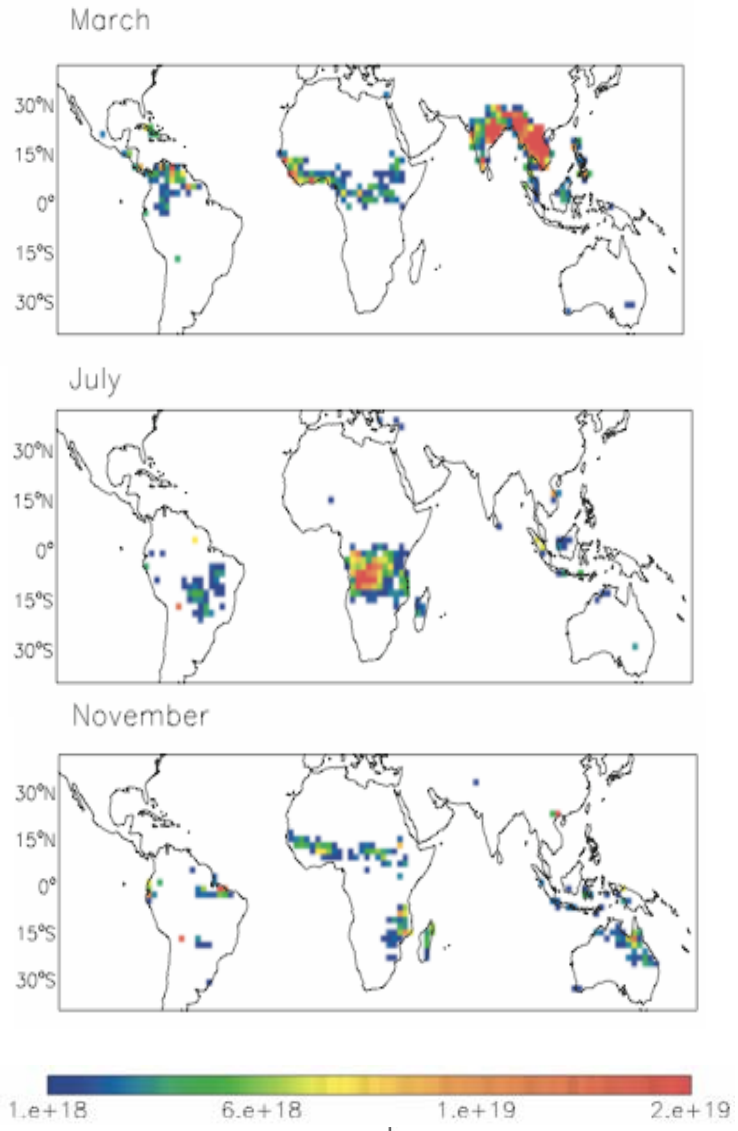
Biomass emissions have strong seasonal dependence.

Wind patterns have less seasonal dependence than other regions studied, generally weak winds north of 20S.



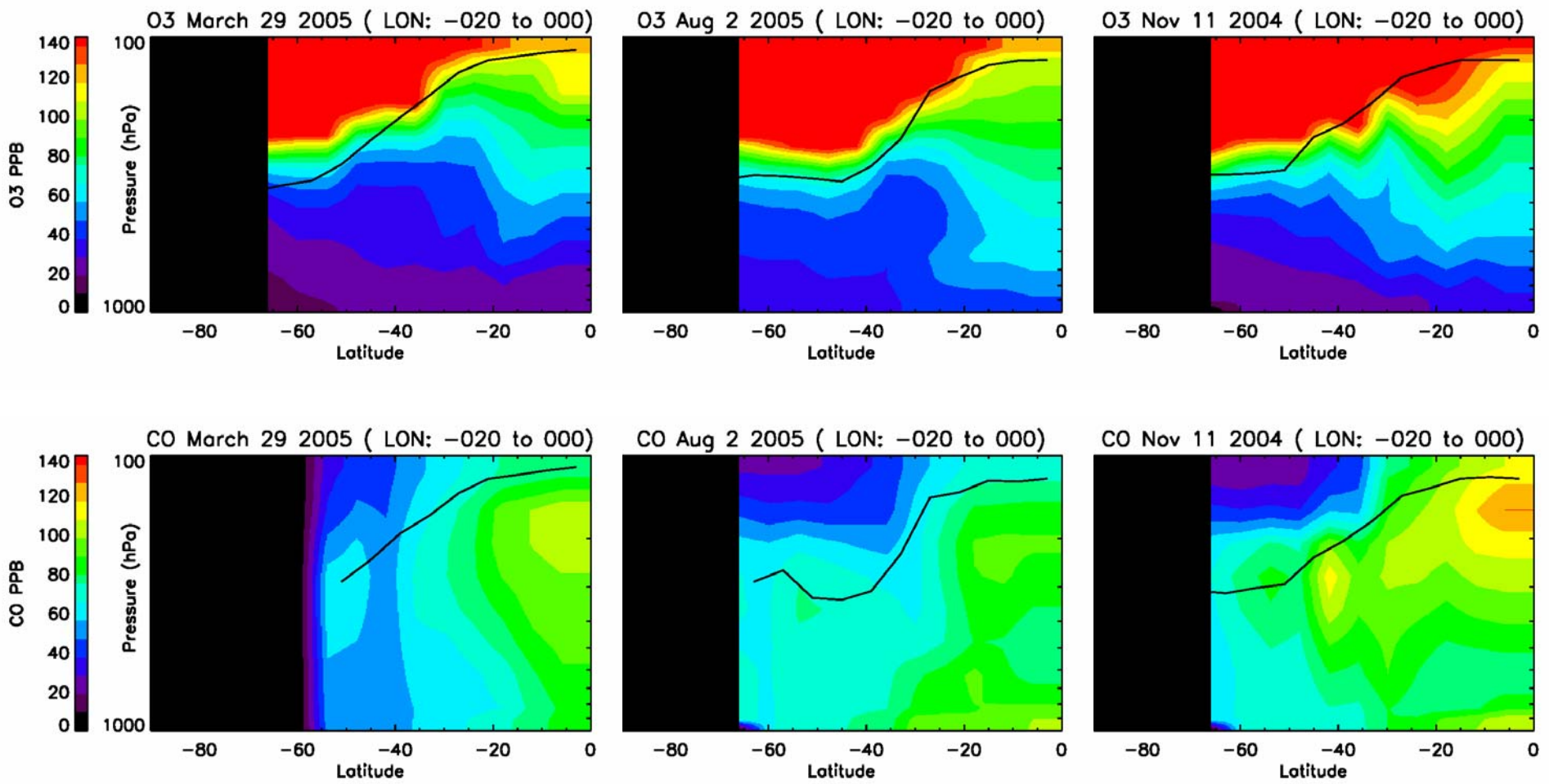






West of africa

In August, elevated CO and ozone near the surface. The November ozone in the upper troposphere corresponds to elevated CO, which is not explained by biomass emissions.



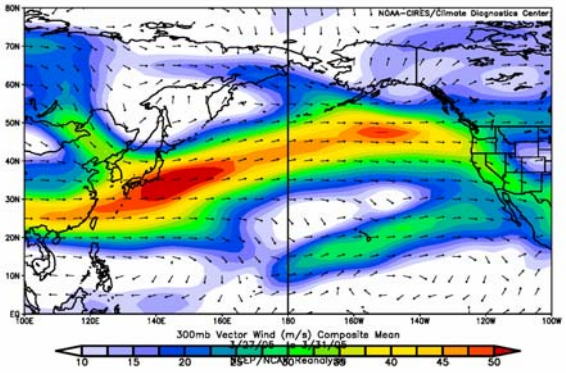
Conclusions

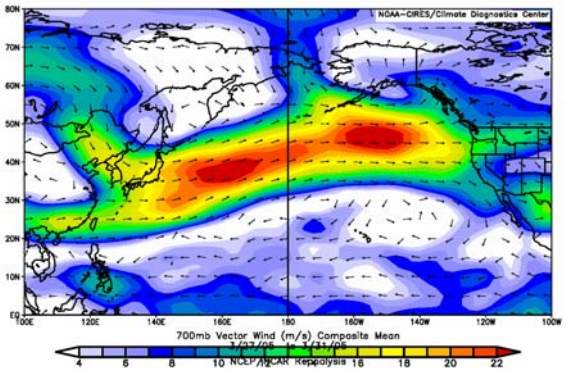
- TES ozone vertical distributions show new, global, information about ozone variation in the lower and upper troposphere.
- Simultaneous CO profiles are valuable in relating ozone to emissions and transport.

Backup slides

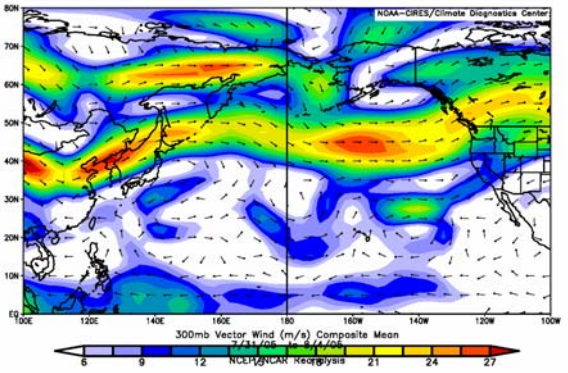
Mean wind fields at 300mb (top row) and 700mb (bottom row)

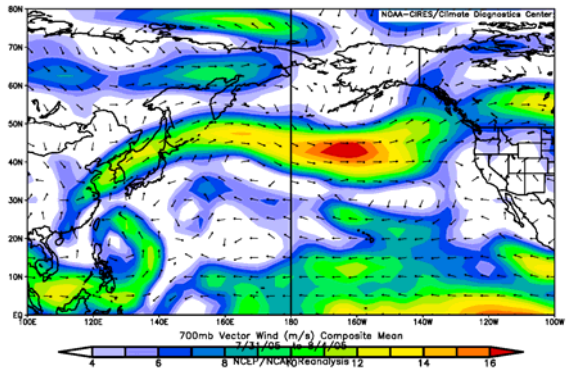
March



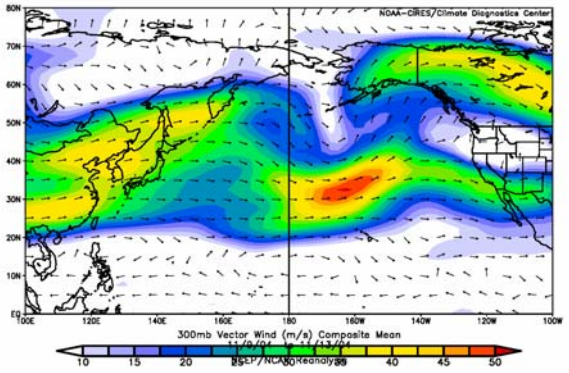


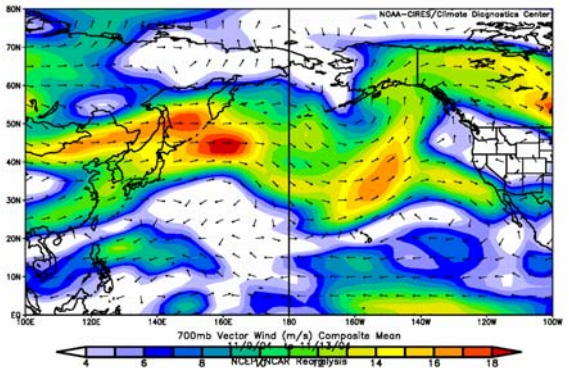
Aug





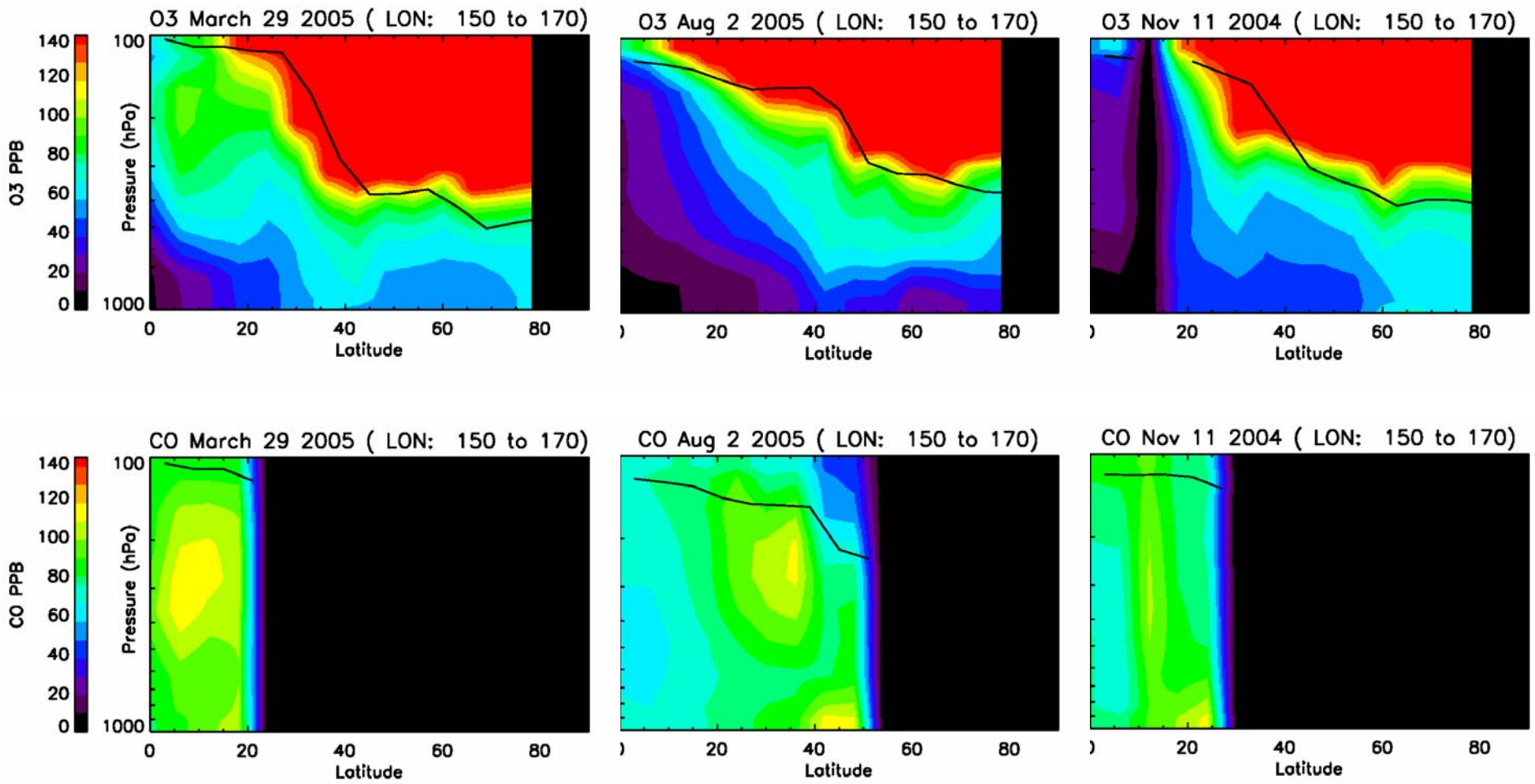
Nov





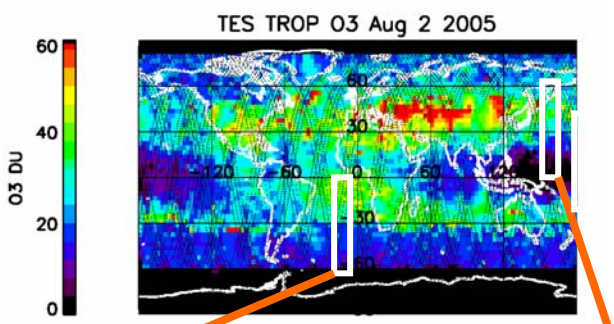
Limited CO sensitivity makes it difficult to assess relative roles of transport and chemistry in this region.

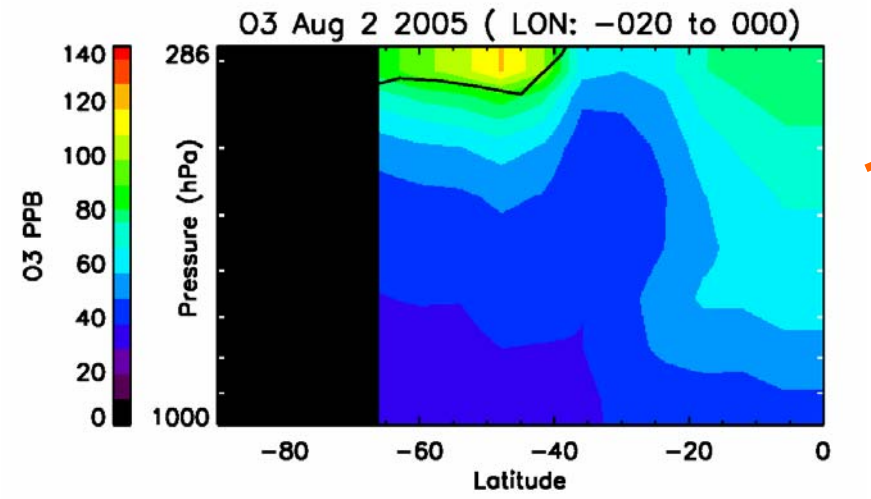
Between Asia and US

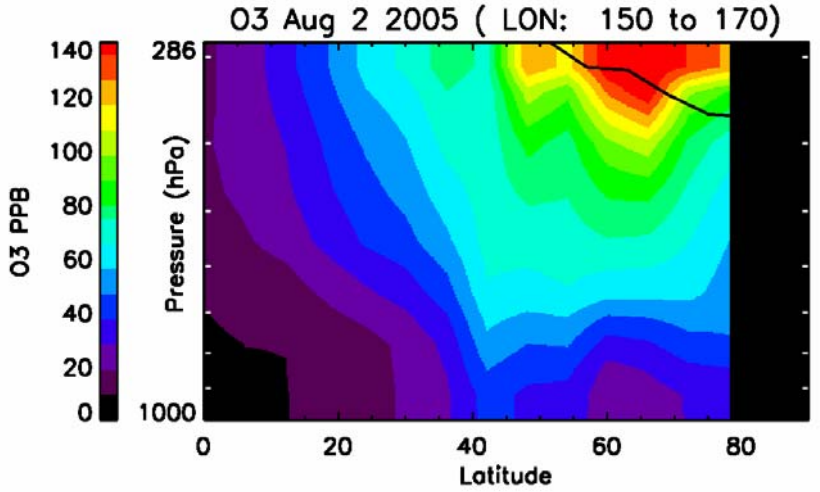


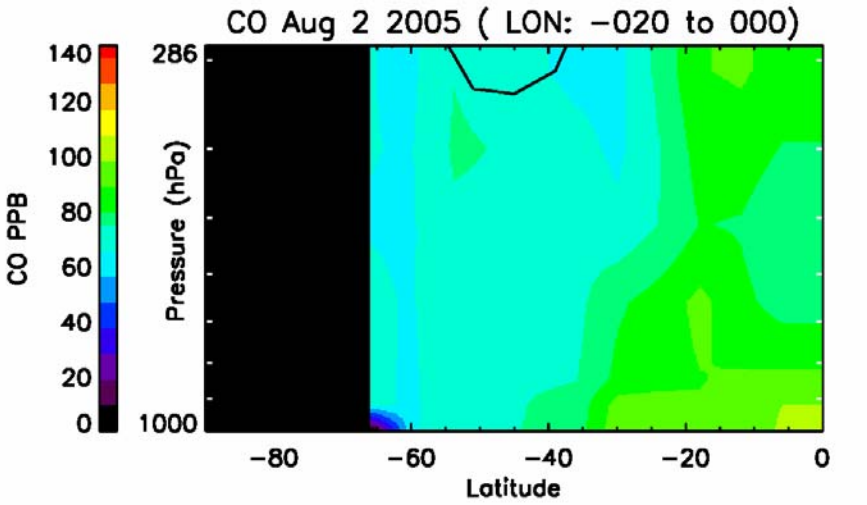
Eldering: Aura mtg, Nov 2005

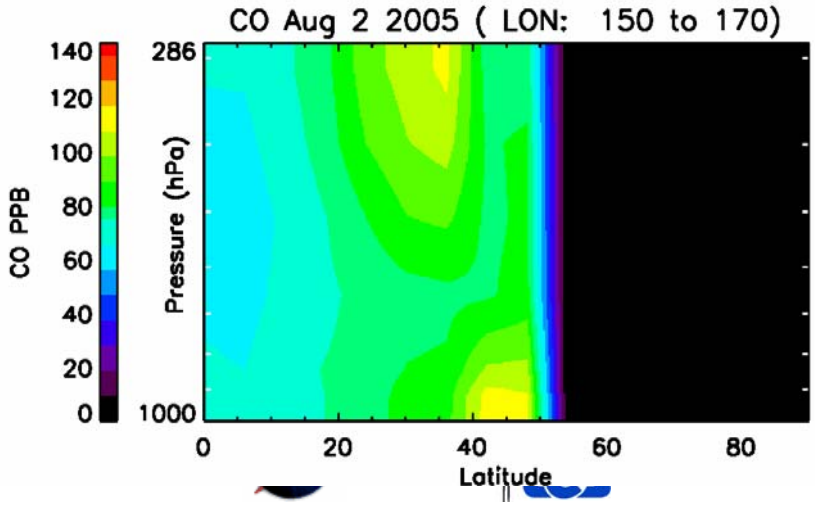
Vertical distribution of O3 and CO offer new insights to pollution formation.











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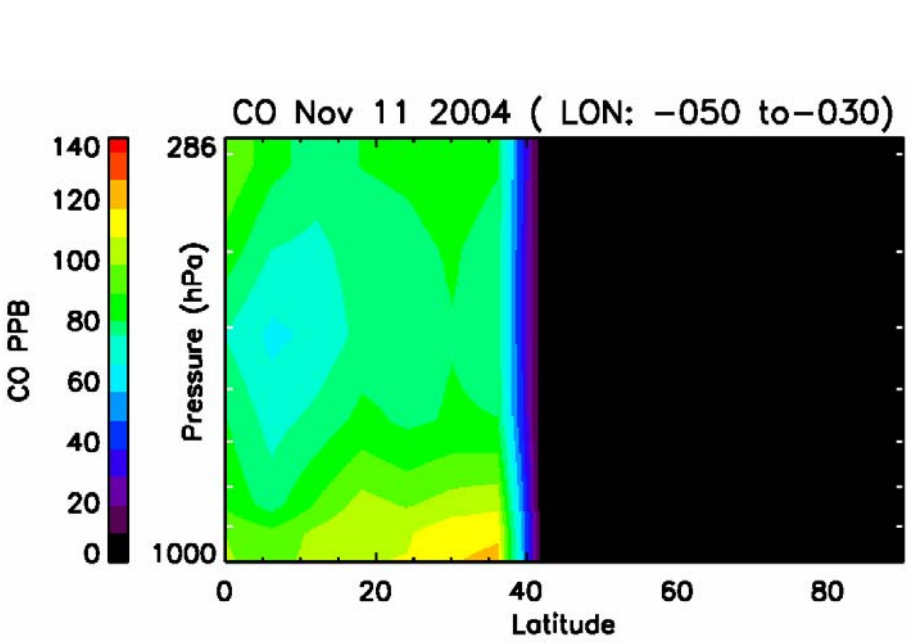
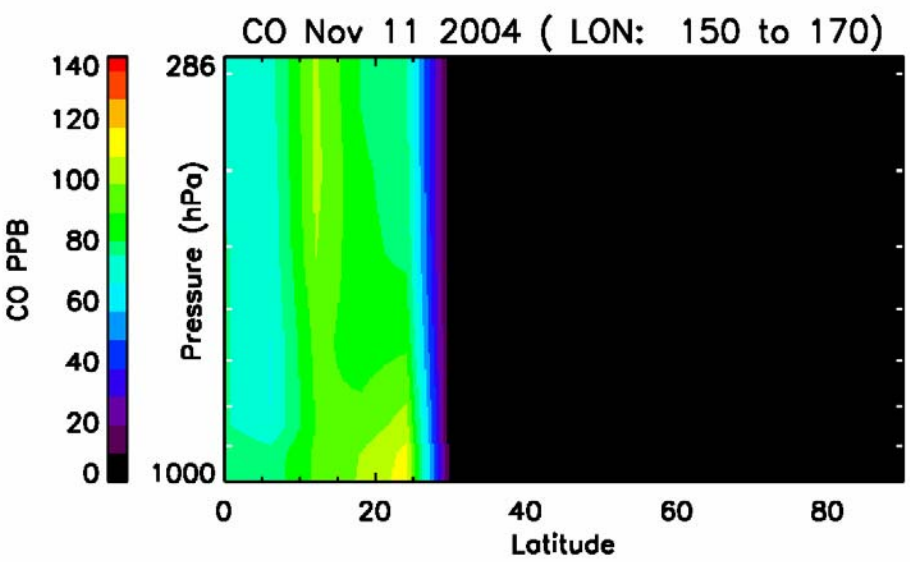
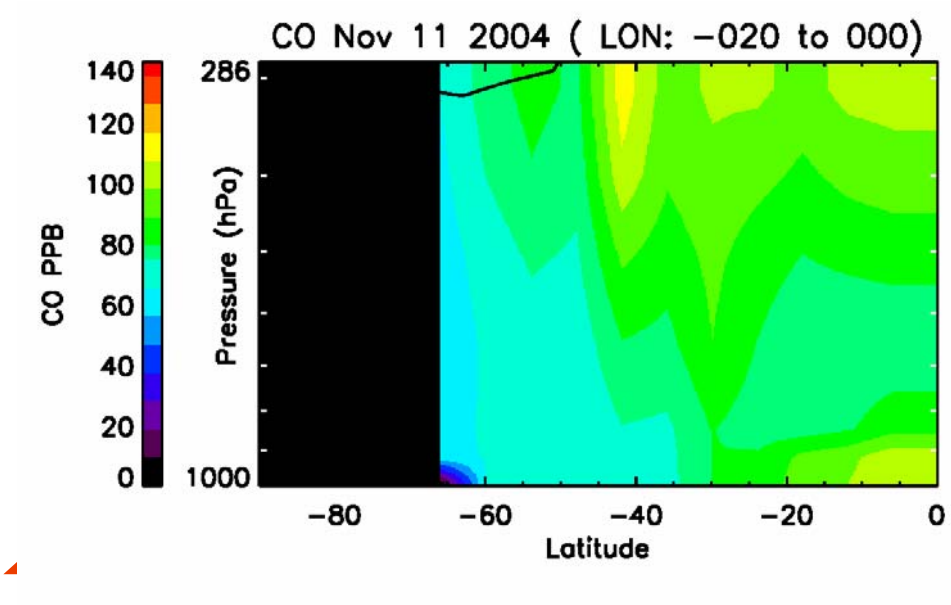
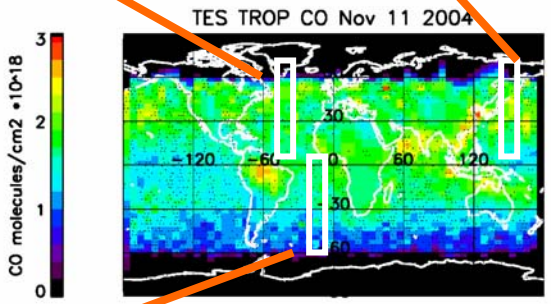

CO Nov 11 2004 (LON: -050 to-030)
CO PPB
Pressure (hPa)
Latitude


CO Nov 11 2004 (LON: 150 to 170)
CO PPB
Pressure (hPa)
Latitude


CO Nov 11 2004 (LON: -020 to 000)
CO PPB
Pressure (hPa)
Latitude


TES TROP CO Nov 11 2004
CO molecules/cm2 •10^18

In contrast to August, November shows less near surface ozone off of Africa, increased ozone between Asia and North America